What is claimed is:

1.    A method for determining whether a data point of an image indicates a presence of a cloud using data including visible, near-infrared, and short wavelength infrared data, the method comprising:

5             performing a first comparison of a cirrus-band reflectance of the data point with a
                    cirrus-band reflectance threshold and classifying the data point as a cloud
                    point if the cirrus-band reflectance of the data point exceeds the cirrus-band
                    reflectance threshold; and
              when the first comparison does not classify the data point as a cloud point,
10                   performing a further analysis of the data point including:
                        performing a second comparison of an additional cloud indicator with an
                             additional cloud indicator threshold, the additional cloud indicator
                             being derived from at least one of the visible, near-infrared, and short
                             wavelength infrared data; and
15                      classifying the data point as one of a cloud point or a non-cloud-point
                             when the second comparison of the additional cloud indicator with the
                             additional cloud indicator threshold allows the data point to be
                             classified as one of a cloud point or a non-cloud point.

2.    The method of Claim 1, wherein the cirrus-band is approximately a 1.88 $\mu$m
20    wavelength cirrus band.

3.    The method of Claim 1, wherein the cirrus-band is approximately a 1.38 $\mu$m wavelength cirrus band.

4.    The method of Claim 1, wherein the additional cloud indicator includes a normalized difference snow index and the additional cloud indicator threshold includes at
25    least one normalized difference snow index threshold.

5.    The method of Claim 4, wherein the additional cloud indicator threshold includes a normalized difference snow index snow threshold such that the data point is classified as a non-cloud point when the normalized difference snow index exceeds the normalized difference snow index snow threshold.

30    6.    The method of Claim 4, wherein the additional cloud indicator threshold includes a normalized difference snow index snow threshold and a normalized difference snow index

cloud threshold such that the data point is classified as a cloud point when the normalized difference snow index is greater than or equal to the normalized difference snow index cloud threshold and the normalized difference snow index is less than or equal to the normalized difference snow index snow threshold.

7.   The method of Claim 6, wherein the normalized difference snow index cloud threshold includes $[(N_M-N_L)/D_T]*D+N_L$ and the normalized difference snow index snow threshold includes $[(N_M-N_H)/D_T]*D+N_L$.

8.   The method of Claim 4, wherein the normalized difference snow index is:

$$NDSI = (\rho_{Green} - \rho_{SWIR1})/(\rho_{Green} + \rho_{SWIR1}).$$

9.   The method of Claim 1, wherein the additional cloud indicator includes a near infrared to short-wavelength infrared ratio and the additional cloud indicator threshold includes a near infrared to short-wavelength infrared ratio snow threshold such that the data point is classified as a non-cloud point when the near infrared to short-wavelength infrared ratio exceeds the near infrared to short-wavelength infrared ratio snow threshold.

10.   The method of Claim 1, wherein the additional cloud indicator includes a near infrared to short-wavelength infrared ratio and the additional cloud indicator threshold includes a near infrared to short-wavelength infrared ratio cloud threshold such that the data point is classified as a non-cloud point when the near infrared to short-wavelength infrared ratio is less than the near infrared to short-wavelength infrared ratio cloud threshold.

11.   The method of Claim 1, wherein the additional cloud indicator includes a red spectrum reflectance and the additional cloud indicator threshold includes a red spectrum reflectance cloud threshold such that the data point is classified as a non-cloud point when the red spectrum reflectance is less than the red spectrum reflectance cloud threshold.

12.   The method of Claim 1, wherein the additional cloud indicator includes a short-wavelength infrared reflectance and the additional cloud indicator threshold includes a short-wavelength reflectance cloud threshold such that the data point is classified as a non-cloud point when the short-wavelength reflectance is less than the short-wavelength reflectance cloud threshold.

13.   The method of Claim 1, wherein the additional cloud indicator includes a D variable and the additional cloud indicator threshold includes a D variable cloud threshold

such that the data point is classified as a non-cloud point when the D variable exceeds the D variable cloud threshold.

14.     The method of Claim 13, wherein the D variable is:

$$D = |NDVI|^{0.6} / (\rho_{Red})^2$$

and where the normalized difference vegetation index, NDVI, is:

$$NDVI = (\rho_{NIR} - \rho_{Red}) / (\rho_{NIR} + \rho_{Red}).$$

15.     The method of Claim 1, wherein the additional cloud indicator includes a D spatial variability index and the additional cloud indicator threshold includes a D spatial variability index cloud threshold such that the data point is classified as a non-cloud point when the a D spatial variability index is greater than the D spatial variability index cloud threshold.

16.     The method of Claim 15, wherein the D spatial variability index is:

$$DSVI = |D_m - D_c|$$

where $D_m$ is mean of D values for a matrix of data points including at least a three-by-three matrix of data points and $D_c$ is a central pixel in the matrix of data points.

17.     The method of Claim 1, wherein the additional cloud indicator threshold is empirically derived from examining additional cloud indicator values for representative sets of empirical data points identified as cloud points or non-cloud points.

18.     The method of Claim 1, wherein the method is iterated for each of a number of data points in a set of imaging data.

19.     A method for determining whether a data point of an image indicates a presence of a cloud using data including visible, near-infrared, and short wavelength infrared data, the method comprising:

  performing a first comparison of a cirrus-band reflectance of the data point with a threshold cirrus-band reflectance value and classifying the data point as a cloud point if the cirrus-band reflectance of the data point exceeds the threshold cirrus-band reflectance value;

when the first comparison does not classify the data point as a cloud point, performing a comparison of a normalized difference snow index with at least one normalized difference snow index threshold; and

classifying the data point as a non-cloud point when the normalized difference snow index falls in a range compared to at least one normalized difference snow index threshold indicating the data point is a non-cloud point.

20. The method of Claim 19, wherein the cirrus-band includes approximately a 1.88 $\mu$m wavelength cirrus band.

21. The method of Claim 19, wherein the cirrus-band includes approximately a 1.38 $\mu$m wavelength cirrus band.

22. The method of Claim 19, wherein the additional cloud indicator threshold includes a normalized difference snow index snow threshold such that the data point is classified as a non-cloud point when the normalized difference snow index exceeds the normalized difference snow index snow threshold.

23. The method of Claim 19, wherein the additional cloud indicator threshold includes a normalized difference snow index snow threshold and a normalized difference snow index cloud threshold such that the data point is classified as a cloud point when the normalized difference snow index is greater than or equal to the normalized difference snow index cloud threshold and the normalized difference snow index is less than or equal to the normalized difference snow index snow threshold.

24. The method of Claim 23, wherein the normalized difference snow index cloud threshold includes $[(N_M-N_L)/D_T]*D+N_L$ and the normalized snow index snow threshold includes $[(N_M-N_H)/D_T]*D+N_L$.

25. The method of Claim 19, wherein the normalized difference snow index is:

$$NDSI = (\rho_{Green} - \rho_{SWIR1})/(\rho_{Green} + \rho_{SWIR1}).$$

26. The method of Claim 19, further comprising analyzing at least one additional cloud indicator for the data point when the first comparison of a cirrus-band reflectance of the data point with the threshold cirrus-band reflectance value and the comparison of the normalized difference snow index and at least one normalized difference snow index threshold do not

classify the data point as one of a cloud point or a non-cloud point to a predetermined classification precision indicated by non-real-time analyses and cloud mask evaluations..

27. The method of Claim 26, wherein the additional cloud indicator includes a near infrared to short-wavelength infrared ratio and the additional cloud indicator threshold includes a near infrared to short-wavelength infrared ratio snow threshold such that the data point is classified as a non-cloud point when the near infrared to short-wavelength infrared ratio exceeds the near infrared to short-wavelength infrared ratio snow threshold.

28. The method of Claim 26, wherein the additional cloud indicator includes a red spectrum reflectance and the additional cloud indicator threshold includes a red spectrum reflectance cloud threshold such that the data point is classified as a non-cloud point when the red spectrum reflectance is less than the red spectrum reflectance cloud threshold.

29. The method of Claim 26, wherein the additional cloud indicator includes a short-wavelength infrared reflectance and the additional cloud indicator threshold includes a short-wavelength reflectance cloud threshold such that the data point is classified as a non-cloud point when the short-wavelength reflectance is less than the short-wavelength reflectance cloud threshold.

30. The method of Claim 26, wherein the additional cloud indicator includes a D variable and the additional cloud indicator threshold includes a D variable cloud threshold such that the data point is classified as a non-cloud point when the D variable exceeds the D variable cloud threshold.

31. The method of Claim 30, wherein the D variable is:

$$D = |NDVI|^{0.6} /(\rho_{Red})^2$$

and where the normalized difference vegetation index, NDVI, is:

$$NDVI = (\rho_{NIR} - \rho_{Red})/(\rho_{NIR} + \rho_{Red}).$$

32. The method of Claim 26, wherein the additional cloud indicator includes a D spatial variability index and the additional cloud indicator threshold includes a D spatial variability index cloud threshold such that the data point is classified as a non-cloud point when the a D spatial variability index is greater than the D spatial variability index cloud threshold.

33.    The method of Claim 32, wherein the D spatial variability index is:

$$DSVI = |D_m - D_c|$$

where $D_m$ is mean of D values for a matrix of data points including at least a three-by-three matrix of data points and $D_c$ is a central pixel in the matrix of data points.

34.    The method of Claim 26, wherein the additional cloud indicator threshold is empirically derived from examining additional cloud indicator values for representative sets of empirical data points manually identified as cloud points or non-cloud points.

35.    The method of Claim 19, wherein the method is iterated for each of a number of data points in a set of imaging data.

36.    A method for determining whether a data point of an image indicates a presence of a cloud using data including visible, near-infrared, and short wavelength infrared data, the method comprising:

performing a first comparison of a cirrus-band reflectance of the data point with a threshold cirrus-band reflectance value and classifying the data point as a cloud point if the cirrus-band reflectance of the data point exceeds the threshold cirrus-band reflectance value;

performing a second comparison of a normalized difference snow index with a normalized difference snow index cloud threshold such that the data point is classified as a non-cloud point when the normalized difference snow index is less than the normalized difference snow index cloud threshold;

performing a third comparison of a D variable with a D variable cloud threshold such that the data point is classified as a non-cloud point when the D variable exceeds the D variable cloud threshold;

performing a fourth comparison of a D spatial variability index with a D spatial variability index cloud threshold such that the data point is classified as a non-cloud point when the a D spatial variability index exceeds the D spatial variability index cloud threshold;

performing a fifth comparison of a near infrared to short-wavelength infrared ratio and a near infrared to short-wavelength infrared ratio cloud threshold such that the data point is classified as a non-cloud point when the near infrared to short-wavelength infrared ratio is less than the near infrared to short-wavelength infrared ratio cloud threshold; and

performing at least one additional comparison of an additional cloud indicator with at least one additional cloud indicator threshold.

37.    The method of Claim 36, wherein the cirrus-band is approximately a 1.88 $\mu$m wavelength cirrus band.

38.    The method of Claim 36, wherein the cirrus-band is approximately a 1.38 $\mu$m wavelength cirrus band.

39.    The method of Claim 36, wherein the normalized difference snow index is:

$$NDSI = \left(\rho_{Green} - \rho_{SWIR1}\right)/\left(\rho_{Green} + \rho_{SWIR1}\right).$$

40.    The method of Claim 36, wherein the D variable is:

$$D = |NDVI|^{0.6} / \left(\rho_{Red}\right)^2$$

and where the normalized difference vegetation index, NDVI, is:

$$NDVI = \left(\rho_{NIR} - \rho_{Red}\right)/\left(\rho_{NIR} + \rho_{Red}\right).$$

41.    The method of Claim 36, wherein the D spatial variability index is:

$$DSVI = |D_m - D_c|$$

where $D_m$ is mean of D values for a matrix of data points including at least a three-by-three matrix of data points and $D_c$ is a central pixel in the matrix of data points.

42.    The method of Claim 36, wherein the additional cloud indicator includes the normalized difference snow index and the additional cloud indicator threshold includes a normalized difference snow index snow threshold such that the data point is classified as a non-cloud point when the normalized difference snow index exceeds the normalized difference snow index snow threshold.

43.    The method of Claim 36, wherein the additional cloud indicator includes the near infrared to short-wavelength infrared ratio and the additional cloud indicator threshold includes the near infrared to short-wavelength infrared ratio snow threshold such that the data point is classified as a non-cloud point when the near infrared to short-wavelength infrared ratio exceeds the near infrared to short-wavelength infrared ratio snow threshold.

44. The method of Claim 36, wherein the additional cloud indicator includes a short-wavelength infrared spectrum reflectance and the additional cloud indicator threshold includes a short-wavelength infrared spectrum reflectance cloud threshold such that the data point is classified as a non-cloud point when the short-wavelength infrared spectrum reflectance is less than the short-wavelength infrared spectrum reflectance cloud threshold.

45. The method of Claim 36, wherein threshold data is empirically derived from examining cloud indicator values for representative sets of empirical data points manually identified as cloud points or non-cloud points.

46. The method of Claim 36, wherein the method is iterated for each of a number of data points in a set of imaging data.

47. A computer-readable medium having stored thereon instructions for determining whether a data point of an image indicates a presence of cloud using data including visible, near-infrared, and short wavelength infrared data, the computer-readable medium comprising:

first computer program code means for performing a first comparison of a cirrus-band reflectance of the data point with a cirrus-band reflectance threshold and classifying the data point as a cloud point if the cirrus-band reflectance of the data point exceeds the cirrus-band reflectance threshold; and

when the first computer program code means does not classify the data point as a cloud point, engaging second computer program code means for performing a further analysis of the data point including:

third computer program code means for performing a second comparison of an additional cloud indicator with an additional cloud indicator threshold, the additional cloud indicator being derived from at least one of the visible, near-infrared ,and short wavelength infrared data; and

fourth computer program code means for classifying the data point as one of a cloud point or a non-cloud-point when the second comparison of the additional cloud indicator with the additional cloud indicator threshold allows the data point to be classified as one of a cloud point or a non-cloud point.

48. The computer-readable medium of Claim 47, wherein the cirrus-band is approximately a 1.88 μm wavelength cirrus band.

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49. The computer-readable medium of Claim 47, wherein the cirrus-band is approximately a 1.38 $\mu$m wavelength cirrus band.

50. The computer-readable medium of Claim 47, wherein the additional cloud indicator includes a normalized difference snow index and the additional cloud indicator threshold includes at least one normalized difference snow index threshold.

51. The computer-readable medium of Claim 50, wherein the additional cloud indicator threshold includes a normalized difference snow index snow threshold such that the data point is classified as a non-cloud point when the normalized difference snow index exceeds the normalized difference snow index snow threshold.

52. The computer-readable medium of Claim 50, wherein the additional cloud indicator threshold includes a normalized difference snow index cloud threshold and a normalized difference snow index snow threshold such that the data point is classified as a cloud point when the normalized difference snow index is greater than or equal to the normalized difference snow index cloud threshold and the normalized difference snow index is less than or equal to the normalized difference snow index snow threshold.

53. The computer-readable medium of Claim 52, wherein the normalized difference snow index cloud threshold includes $[(N_M-N_L)/D_T]*D+N_L$ and the normalized snow index snow threshold includes $[(N_M-N_H)/D_T]*D+N_L$.

54. The computer-readable medium of Claim 50, wherein the normalized difference snow index is:

$$NDSI = (\rho_{Green} - \rho_{SWIR1})/(\rho_{Green} + \rho_{SWIR1}).$$

55. The computer-readable medium of Claim 47, wherein the additional cloud indicator includes a near infrared to short-wavelength infrared ratio and the additional cloud indicator threshold includes a near infrared to short-wavelength infrared ratio snow threshold such that the data point is classified as a non-cloud point when the near infrared to short-wavelength infrared ratio exceeds the near infrared to short-wavelength infrared ratio snow threshold.

56. The computer-readable medium of Claim 47, wherein the additional cloud indicator includes a red spectrum reflectance and the additional cloud indicator threshold includes a red spectrum reflectance cloud threshold such that the data point is classified as a

non-cloud point when the red spectrum reflectance is less than the red spectrum reflectance cloud threshold.

57. The computer-readable medium of Claim 47, wherein the additional cloud indicator includes a short-wavelength infrared reflectance and the additional cloud indicator threshold includes a short-wavelength reflectance cloud threshold such that the data point is classified as a non-cloud point when the short-wavelength reflectance is less than the short-wavelength reflectance cloud threshold.

58. The computer-readable medium of Claim 47, wherein the additional cloud indicator includes a D variable and the additional cloud indicator threshold includes a D variable cloud threshold such that the data point is classified as a non-cloud point when the D variable exceeds the D variable cloud threshold.

59. The computer-readable medium of Claim 58, wherein the D variable is:

$$D = |NDVI|^{0.6} / (\rho_{\text{Red}})^2$$

and where the normalized difference vegetation index, NDVI, is:

$$NDVI = (\rho_{NIR} - \rho_{\text{Red}}) / (\rho_{NIR} + \rho_{\text{Red}}).$$

60. The computer-readable medium of Claim 47, wherein the additional cloud indicator includes a D spatial variability index and the additional cloud indicator threshold includes a D spatial variability index cloud threshold such that the data point is classified as a non-cloud point when the a D spatial variability index is greater than the D spatial variability index cloud threshold.

61. The computer-readable medium of Claim 60, wherein the D spatial variability index is:

$$DSVI = |D_m - D_c|$$

where $D_m$ is mean of D values for a matrix of data points including at least a three-by-three matrix of data points and $D_c$ is a central pixel in the matrix of data points.

62. The computer-readable medium of Claim 47, wherein the additional cloud indicator threshold is empirically derived from examining additional cloud indicator values for representative sets of empirical data points identified as cloud points or non-cloud points.

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63.    The computer-readable medium of Claim 47, wherein the instructions stored on the computer-readable medium are iterated for each of a number of data points in a set of imaging data.

64.    A system for determining whether a data point of an image indicates a presence of cloud using data including visible, near-infrared, and short wavelength infrared data, the system comprising:

a cirrus-band comparator configured to perform a first comparison of a cirrus-band reflectance of the data point with a cirrus-band reflectance threshold and to classify the data point as a cloud point if the cirrus-band reflectance of the data point exceeds the cirrus-band reflectance threshold; and

a secondary comparator configured to perform at least one secondary comparison when the cirrus-band comparator does not classify the data point as a cloud point, the secondary comparator being configured to perform the second comparison of an additional cloud indicator with an additional cloud indicator threshold, the additional cloud indicator being derived from at least one of the visible, near-infrared, and short wavelength infrared data, and further configured to classify the data point as one of a cloud point or a non-cloud-point.

65.    The system of Claim 64, wherein the cirrus-band is approximately a 1.88 $\mu$m wavelength cirrus band.

66.    The system of Claim 64, wherein the cirrus-band is approximately a 1.38 $\mu$m wavelength cirrus band.

67.    The system of Claim 64, wherein the additional cloud indicator includes a normalized difference snow index and the additional cloud indicator threshold includes at least one normalized difference snow index threshold.

68.    The system of Claim 67, wherein the additional cloud indicator threshold includes a normalized difference snow index snow threshold such that the data point is classified as a non-cloud point when the normalized difference snow index exceeds the normalized difference snow index snow threshold.

69.    The system of Claim 67, wherein the additional cloud indicator threshold includes a normalized difference snow index cloud threshold and a normalized difference snow index

snow threshold such that the data point is classified as a cloud point when the normalized difference snow index is greater than or equal to the normalized difference snow index cloud threshold and the normalized difference snow index is less than or equal to the normalized difference snow index snow threshold.

70.    The system of Claim 69, wherein the normalized difference snow index cloud threshold includes $[(N_M-N_L)/D_T]*D+N_L$ and normalized snow index snow threshold includes $[(N_M-N_H)/D_T]*D+N_L$.

71.    The system of Claim 67, wherein the normalized difference snow index is:

$$NDSI = \left(\rho_{Green} - \rho_{SWIR1}\right)/\left(\rho_{Green} + \rho_{SWIR1}\right).$$

72.    The system of Claim 64, wherein the additional cloud indicator includes a near infrared to short-wavelength infrared ratio and the additional cloud indicator threshold includes a near infrared to short-wavelength infrared ratio snow threshold such that the data point is classified as a non-cloud point when the near infrared to short-wavelength infrared ratio exceeds the near infrared to short-wavelength infrared ratio snow threshold.

73.    The system of Claim 64, wherein the additional cloud indicator includes a red spectrum reflectance and the additional cloud indicator threshold includes a red spectrum reflectance cloud threshold such that the data point is classified as a non-cloud point when the red spectrum reflectance is less than the red spectrum reflectance cloud threshold.

74.    The system of Claim 64, wherein the additional cloud indicator includes a short-wavelength infrared reflectance and the additional cloud indicator threshold includes a short-wavelength reflectance cloud threshold such that the data point is classified as a non-cloud point when the short-wavelength reflectance is less than the short-wavelength reflectance cloud threshold.

75.    The system of Claim 64, wherein the additional cloud indicator includes a D variable and the additional cloud indicator threshold includes a D variable cloud threshold such that the data point is classified as a non-cloud point when the D variable exceeds the D variable cloud threshold.

76.    The system of Claim 75, wherein the D variable is:

$$D = |NDVI|^{0.6} /\left(\rho_{Red}\right)^2$$

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and where the normalized difference vegetation index, NDVI, is:

$$NDVI = \left( \rho_{NIR} - \rho_{Red} \right) / \left( \rho_{NIR} + \rho_{Red} \right).$$

77.   The system of Claim 64, wherein the additional cloud indicator includes a D spatial variability index and the additional cloud indicator threshold includes a D spatial variability index cloud threshold such that the data point is classified as a non-cloud point when the a D spatial variability index is greater than the D spatial variability index cloud threshold.

78.   The system of Claim 77, wherein the D spatial variability index is:

$$DSVI = \left| D_m - D_c \right|$$

where $D_m$ is mean of D values for a matrix of data points including at least a three-by-three matrix of data points and $D_c$ is a central pixel in the matrix of data points.

79.   The system of Claim 64, wherein the additional cloud indicator threshold is empirically derived from examining additional cloud indicator values for representative sets of empirical data points identified as cloud points or non-cloud points.

80.   The system of Claim 64, wherein the system is further configured to iteratively process each of a number of data points in a set of imaging data.